

Claims

1. (Currently Amended) A method for making a structure, at least a portion of which is intermetallic, the method comprising:

~~providing at least one machinable intermetallic lamina;~~

machining ~~the~~ at least one machinable intermetallic lamina to form a machined intermetallic lamina;

stacking and registering the ~~at least one~~ machined intermetallic lamina with at least one other lamina selected from ~~the group of~~ patterned lamina, non-patterned lamina and combinations thereof, thereby forming a registered stack; and

processing the registered stack to make an intermetallic structure.

2. (Original) The method according to claim 1 where the intermetallic lamina is a nickel aluminide.

3. (Original) The method according to claim 2 where the nickel aluminide is NiAl.

4. (Original) The method according to claim 2 where the nickel aluminide is Ni₃Al.

5. (Original) The method according to claim 1 where the intermetallic lamina is an iron aluminide.

6. (Original) The method according to claim 5 where the iron aluminide is FeAl.

7. (Original) The method according to claim 5 where the iron aluminide is Fe₃Al.

8. (Original) The method according to claim 1 where the intermetallic lamina is a titanium aluminide.

9. (Original) The method according to claim 8 where the titanium aluminide is TiAl.

10. (Original) The method according to claim 8 where the titanium aluminide is Ti_3Al .
11. (Original) The method according to claim 1 further comprising adding at least one bonding lamina or layer to the registered stack to facilitate bonding between a first intermetallic lamina and a second intermetallic lamina.
12. (Original) The method according to claim 11 where the bonding lamina is substantially pure nickel.
13. (Original) The method according to claim 12 where the bonding lamina has a thickness of from about 5 to about 10 microns.
14. (Currently Amended) The method according to claim 1 where machining is a technique selected from the group consisting of comprises lithography, laser ablation, an electrochemical ~~processes~~ machining process, chemical etching, plasma etching, mechanical cutting, a hydraulic ~~processes~~ process, solid abrasion, particle beam, ultrasonic machining ~~processes~~, electromagnetic ~~processes~~ machining, ~~including momentum transfer and energy transfer from any portion of the electromagnetic spectrum~~, wire and ram electrodischarge (EDM), waterjet, ~~and~~ abrasive waterjet, precision plasma cutting, ~~and~~ or combinations thereof.
15. (Currently Amended) The method according to claim 1 ~~where providing~~ comprises comprising procuring a patterned lamina or lamina blank.
16. (Original) The method according to claim 1 further comprising providing at least a second lamina in addition to the at least one machinable intermetallic lamina, the second lamina comprising at least a first metal layer and a second metal layer.
17. (Currently Amended) The method according to claim 16 where each of the first and second metal layers comprises a substantially pure ~~element~~ metal prior to heat treatment.

18. (Original) The method according to claim 17 where the second lamina comprises three metal layers.

19. (Original) The method according to claim 18 where one of the layers comprises an element different from the other two layers.

20. (Currently Amended) The method according to claim 19 where one of the layers is ~~selected from the group consisting of~~ substantially pure iron, nickel, titanium ~~and or~~ aluminum.

21. (Original) The method according to claim 18 wherein two of the layers are substantially pure aluminum, and one layer is substantially pure nickel.

22. (Original) The method according to claim 18 where two of the layers are substantially pure aluminum, and one layer is substantially pure titanium.

23. (Currently Amended) The method according to claim 1 ~~where coupling is accomplished using~~ further comprising applying an adhesive applied between two or more laminae.

24. (Original) The method according to claim 17 where processing comprises vacuum heating at a temperature and for a length of time sufficient to form an intermetallic.

25. (Original) The method according to claim 16 where processing further comprises liquid-phase bonding.

26. (Original) The method according to claim 16 where processing further comprises diffusion bonding.

27. (Original) The method according to claim 1 wherein the intermetallic structure includes one or more catalysts operatively associated therewith.

28. (Original) An intermetallic device made according to the method of claim 1.

29. (Original) A device comprising a patterned intermetallic portion.
30. (Currently Amended) The device according to claim 29 selected from ~~the group consisting of~~ micromechanical systems, microelectromechanical systems, miniature energy and chemical systems, microthermal systems, microthermomechanical systems, cryocoolers, Stirling cycle cryocoolers, heat pumps, compressors, thermal compressors, refrigerators, heat engines, valves, nozzled valves, ink jet print head valves, fuel cells, fuel combustors, fuel processors, electromagnetic systems, electromagnetically enhanced systems, magnetic systems, magnetically enhanced systems, and systems comprising one or more of these devices.
31. (Original) A method for making an intermetallic structure, comprising:
providing a plurality of stacked and registered laminae; and
heat processing the stacked and registered laminae to form a monolithic structure comprising an intermetallic.
32. (Original) The method according to claim 31 where at least one of the plurality of stacked and registered laminae is a patterned intermetallic lamina.
33. (Original) The method according to claim 31 where at least one lamina of the plurality of stacked and registered laminae comprises at least a first metal layer and a second metal layer.
34. (Original) The method according to claim 33 where the at least one lamina is patterned prior to heat processing.
35. (Original) The method according to claim 31 where at least a first lamina of the plurality of stacked and registered laminae is a patterned intermetallic lamina, and where at least

a second lamina of the plurality of stacked and registered laminae comprises at least a first metal layer and a second metal layer.

36. (Original) The method according to claim 35 where the second lamina is patterned prior to heat processing.

37. (Original) The method according to claim 31 where at least two adjacent lamina are connected by at least one post.

38. (Original) The method according to claim 31 further comprising operatively associating at least one catalyst with the structure.

39. (Currently Amended) The method according to claim 32 where the intermetallic lamina is patterned using ~~a technique selected from the group consisting of~~ lithography, laser ablation, electrochemical meanspatterning, chemical etching, plasma etching, mechanical cutting, hydraulic meanspatterning, solid abrasion, particle beam, ultrasonic meanspatterning; electromagnetic meanspatterning, wire and ram electrodischarge (EDM) patterning, waterjet and abrasive waterjet, precision plasma cutting, and combinations thereof.

40. (Original) The method according to claim 32 where the intermetallic portion is a nickel aluminide.

41. (Original) The method according to claim 32 where the intermetallic portion is an iron aluminide.

42. (Original) The method according to claim 32 where the intermetallic portion is a titanium aluminide.

43. (Currently Amended) The method according to claim 31 where at least one of the lamina in the registered stack of laminae comprises a metal selected from ~~the group consisting of~~ aluminum, nickel, titanium, molybdenum, tantalum, copper, gold, silver, lead, tin, iron,

antimony, magnesium, manganese, bismuth, germanium, tungsten, binary alloys thereof, binary intermetallics thereof, ternary alloys thereof, ternary intermetallics thereof, and combinations thereof.

44. (Original) The method according to claim 43 where the metal is a metal foil.

45. (Currently Amended) The method according to claim 31 where the stacked ~~lamin~~laminae comprise plural intermetallic foils.